HUMAN VACCINES & IMMUNOTHERAPEUTICS
2023, VOL. 19, NO. 1, 2171231
https://doi.org/10.1080/21645515.2023.2171231

Taylor & Francis
Taylor & Francis Group

CASE REPORT

OPEN ACCESS Check for updates

Effects of COVID-19 vaccine type on Guillain-Barré syndrome: Two cases and a literature review

Hsin-Yu Lee[a] and Wan-Ching Lien[a,b]

[a]Department of Emergency Medicine, National Taiwan University Hospital, Taipei, Taiwan; [b]Department of Emergency Medicine, College of Medicine, National Taiwan University, Taipei, Taiwan

ABSTRACT

Guillain-Barré syndrome (GBS) is a rare but severe complication of COVID-19 vaccination. We report two cases of GBS following vaccination with the adenovirus vector vaccine ChAdOx1 nCoV-19 (Vaxzevria, AstraZeneca) and review the relevant literature. Relevant studies published between December 2020 and May 2022 including 881 patients with GBS were reviewed. GBS incidence and the need for mechanical ventilation were reported at a higher level among patients receiving Vaxzevria (n = 400). However, incidence cannot be accurately estimated from case reports. Thus, the true GBS rates following COVID-19 vaccination should be determined by population-based data.

ARTICLE HISTORY
Received 10 November 2022
Revised 5 January 2023
Accepted 18 January 2023

KEYWORDS
COVID-19 vaccine;
Guillain-Barré syndrome

More than 175 COVID-19 vaccines have been developed.[1,2] However, unexpected neurological complications may occur after COVID-19 vaccination.[3] The associations between COVID-19 vaccine type and Guillain-Barré syndrome (GBS) remain unclear. We report two adult patients who presented with GBS following ChAdOx1 nCoV-19 (Vaxzevria, AstraZeneca) vaccination and provide a review of the literature.

Case 1

A 43-year-old woman presented to the emergency department with progressive numbness that had spread throughout her entire body and first occurred 9 days after her first dose of Vaxzevria. She reported difficulty climbing stairs, with dyspnea and diplopia on the 10th day. The laboratory data showed a negative COVID-19 polymerase chain reaction (PCR) test and clear cerebrospinal fluid. No obvious thrombus was noted in computed tomography. A nerve conduction velocity (NCV) test suggested lumbosacral polyradiculopathy. Analysis of her evoked potential system indicated normal somatosensory evoked potentials. Her vital capacity was 2000 mL. She received a fresh frozen plasma exchange five times every other day, and she could later walk with a cane.

Case 2

A 54-year-old man presented with progressive numbness spreading throughout his entire body that had first occurred 12 days after his first dose of Vaxzevria. Unsteady gait followed. A negative COVID PCR test was noted and laboratory data revealed clear cerebrospinal fluid. Brain magnetic resonance imaging indicated no intracranial lesions. His NCV test findings were compatible with demyelinating polyradiculoneuropathy and superimposed bilateral trigeminal neuropathy. His vital capacity was 3000 mL. Human immunoglobulin treatment (gamma globin, 2 mg/kg) was administered for 5 days, and his condition gradually improved.

Literature review

The search keywords "GBS" and "COVID-19 vaccine" were used with no language restrictions to search PubMed, Embase, and Google Scholar for reports published between December 2020 and May 2022. Patients older than 18 years were included. Patients with a medical history of GBS were excluded. Patient data, including age, sex, clinical presentation, and GBS variant (i.e., acute motor axonal neuropathy, acute motor and sensory axonal neuropathy, bilateral facial palsy with paresthesia, or Miller Fisher syndrome), were extracted if available. All data were analyzed using SAS (SAS 9.4, Cary, NC, USA). Categorical data are expressed in counts and proportions and were compared using the chi-square test or Fisher's exact test. A p-value of less than 0.05 was considered statistically significant.

A total of 879 patients from 72 articles and our two patients were included in the review (Table 1). Most of the included articles were case reports (Supplementary Table S1). GBS incidence was higher among patients who had received the Vaxzevria vaccine (n = 400). GBS variants were more common among those who had received Vaxzevria (23/400) than among those who had received Jcovden (2/167, $p = .009$) or Spikevax (0, $p = .004$). Back pain before GBS was reported more commonly in patients receiving Vaxzevria than in those

CONTACT Wan-Ching Lien wanchinglien@ntu.edu.tw Department of Emergency Medicine, National Taiwan University Hospital, No.7, Chung-Shan South Road, Taipei 100, Taiwan.

Supplemental data for this article can be accessed on the publisher's website at https://doi.org/10.1080/21645515.2023.2171231.

Table 1. A summary of Guillain-Barre syndrome following COVID-19 vaccines in current publications and our 2 cases.

Vaccine types (generic name)	Reporting rate (number of reports per 1 million administered doses)	Age, yrs	Onset	Variant[†], n	Mechanical ventilation, n
Vaxzevria (n = 400)*	10[‡] 5.49[§]	20–84	Day 2-77	AMAN, 5 BFP, 14 MF, 1 Paraparetic, 1 Sensory, 2	31
Comirnaty (n = 191)	0.69[¶]	18–86	Day 1-90	AMSAN, 1 MF, 5 Sensory, 1	4
Jcovden (n = 167)	5.26[¶]	24–76	Day 5-75	AMSAN, 1 BFP, 1	1
Spikevax (n = 108)	0.68[¶]	49–86	Day 1-45	0	0
Sputnik V (n = 9)		37–52	Day 8-21	BFP, 5	1
Covilo (n = 4)		26–87	Day 4-37	AMAN, 2	0
CoronaVac (n = 2)		53–76	Day 8-14	AMAN, 1 MF, 1	0

*adding our 2 cases.
[†]AMAN, acute motor axonal neuropathy; AMSAN, acute motor and sensory axonal neuropathy; BFP, bilateral facial palsy with paresthesias; MF, Miller-Fisher variant.
[‡]Woo EJ, Mba-Jonas A, Dimova RB, Alimchandani M, Zinderman CZ, Nair N. Association of Receipt of the Ad26.COV2.S COVID-19 Vaccine With Presumptive Guillain-Barré Syndrome, February-July 2021. JAMA. 2021;326:1606–13.
[§]Keh RYS, Scanlon S, Datta-Nemdharry P, Donegan K, Cavanagh S, Foster M, et al. COVID-19 vaccination and Guillain-Barré syndrome: analyses using the National Immunoglobulin Database. Brain. 2022:awac067.
[¶]Frontera JA, Tamborska AA, Doheim MF, Garcia-Azorin D GH, Guekht A, Yusof Khan AHK, Santacatterina M, Sejvar J, Thakur KT, Westenberg E, Winkler AS, Beghi E; contributors from the Global COVID-19 Neuro Research Coalition. Neurological Events Reported after COVID-19 Vaccines: An Analysis of VAERS. Ann Neurol. 2022:10.1002/ana.26339.

receiving Comirnaty (17/400 vs. 1/191, $p = .005$), Jcovden (17/400 vs. 1/167, $p = .009$), or Spikevax (17/400 vs. 0, $p = .016$). More patients receiving Vaxzevria required mechanical ventilation, compared with those receiving Comirnaty (31/400 vs. 4/191, $p = .003$), Jcovden (31/400 vs. 1/167, $p = .0001$), or Spikevax (31/400 vs. 0, $p = .005$).

Many vaccines are being developed, and diverse technologies have different advantages against the COVID-19 pandemic.[4] Currently, the Comirnaty vaccine is the most widely administered, followed by Spikevax and Vaxzevria.[2] These results show that in published case reports, the Vaxzevria vaccine was associated with more occurrences of GBS, as well as more back pain and the need for mechanical ventilation.

The Vaxzevria vaccine uses adenovirus as a carrier of the gene that encodes the spike protein of the coronavirus. However, Jcovden and Sputnik V (adenovirus vector, Gamaleya Institute) also use adenovirus vectors but have been associated with lower GBS incidence. Some authors have proposed that certain vaccine components may elicit antiganglioside antibody production, resulting in GBS.[4–6]

Our findings suggest the rare but clinically significant potential for GBS development following vaccination with Vaxzevria. Countries reported different numbers of serious adverse events, causing reporting bias. Determining the genuine rates of GBS requires the use of databases such as the Vaccine Adverse Event Reporting System,[3,4] which compiles reports of adverse events across the entire reporting population. More detailed patient characteristics such as the number of doses administered could not be obtained. Although the aforementioned limitations restricted interpretation, our findings highlight the need for vigilance for GBS after COVID-19 vaccination, particularly for patients receiving Vaxzevria.

Acknowledgments

We thank the Ministry of Science and Technology, Taiwan for financial support (MOST 111-2410-H-002-211). We also thank Dr. Chih-Wei Sung for the statistical consultation and the Wallace English editing for grammar editing.

Disclosure statement

No potential conflict of interest was reported by the author(s).

References

1. Khandker SS, Godman B, Jawad MI, Meghla BA, Tisha TA, Khondoker MU, Haq MA, Charan J, Talukder AA, Azmuda N, et al. A systematic review on COVID-19 vaccine strategies, their effectiveness, and issues. Vaccines (Basel). 2021;9:1387. doi:10.3390/vaccines9121387.
2. WHO. COVID-19 vaccines; 2022.
3. Menni C, Klaser K, May A, Polidori L, Capdevila J, Louca P, Sudre CH, Nguyen LH, Drew DA, Merino J, et al. Vaccine side-effects and SARS-CoV-2 infection after vaccination in users of the COVID Symptom Study app in the UK: a prospective observational study. Lancet Infect Dis. 2021;21:939–49. doi:10.1016/S1473-3099(21)00224-3.
4. Hanson KE, Goddard K, Lewis N, Fireman B, Myers TR, Bakshi N, Weintraub E, Donahue JG, Nelson JC, Xu S, et al. Incidence of Guillain-Barré syndrome after COVID-19 vaccination in the vaccine safety datalink. JAMA Netw Open. 2022;5:e228879. doi:10.1001/jamanetworkopen.2022.8879.
5. Introna A, Caputo F, Santoro C, Guerra T, Ucci M, Mezzapesa DM, Trojano M. Guillain-Barré syndrome after AstraZeneca COVID-19-vaccination: a causal or casual association? Clin Neurol Neurosurg. 2021;208:106887. doi:10.1016/j.clineuro.2021.106887.
6. Trimboli M, Zoleo P, Arabia G, Gambardella A. Guillain-Barré syndrome following BNT162b2 COVID-19 vaccine. Neurol Sci. 2021;42:4401–02. doi:10.1007/s10072-021-05523-5.